

WHAT IS CLAIMED IS:

1. A vehicular brake force control apparatus comprising:
 - a determination device that determines whether vehicle behavior of a vehicle is liable to become unstable when engine brake acts;
 - an estimation device that estimates an engine brake force when engine brake acts, in the case that it is determined that the vehicle behavior is liable to become unstable;
 - a distribution device that distributes the estimated engine brake force to each wheel as a brake force in accordance with a distribution that stabilizes the vehicle behavior of the vehicle; and
 - a control device that controls at least one of an actual engine brake force and an actual friction control force that are applied to each wheel, such that the brake force distributed to each wheel is attained.
2. The vehicular brake force control apparatus according to claim 1, wherein the vehicle is a rear wheel drive vehicle, and the determination device determines the vehicle behavior is liable to become unstable when engine brake acts in the case that a degree of grip of a rear wheel is equal to or less than a predetermined value.
3. The vehicular brake force control apparatus according to claim 2, wherein the determination device determines that the vehicle behavior is liable to become unstable when engine brake acts in the case that the vehicle is in a non-driven state and the degree of grip of the rear wheel is equal to or below the predetermined value.
4. The vehicular brake force control apparatus according to claim 2, wherein the determination device estimates a road surface friction coefficient, estimates a front-rear acceleration at a rear wheel position and a lateral acceleration at a rear wheel position, and calculates the degree of grip of the rear wheel based on the road surface friction coefficient, the front-rear acceleration, and the lateral acceleration.
5. The vehicular brake force control apparatus according to claim 1, wherein the determination device reduces a threshold value used on occasions when it is determined that the vehicle behavior is liable to become unstable in accordance with a road surface

friction coefficient becoming smaller.

6. The vehicular brake force control apparatus according to claim 1, wherein the control device controls the engine brake force based upon the brake force that is smallest among the brake forces distributed to driven wheels.

7. The vehicular brake force control apparatus according to claim 1, wherein the distribution device estimates, when a brake operation is executed by a driver, an overall vehicle target friction brake force based upon a brake operation amount of the driver, and distributes a sum of the estimated engine brake force and the estimated overall vehicle target friction brake force among the respective wheels.

8. The vehicular brake force control apparatus according to claim 7, wherein the distribution device estimates a ground load of each wheel, and distributes the sum of the estimated engine brake force and the estimated overall vehicle target friction brake force among the respective wheels in accordance with a ratio corresponding to a ratio of the ground loads of the respective wheels.

9. The vehicular brake force control apparatus according to claim 7, wherein the distribution device calculates a vehicle target yaw rate based upon a steering amount of the driver, calculates a difference between the vehicle target yaw rate and a vehicle actual yaw rate, and distributes the sum of the estimated engine brake force and the estimated overall vehicle target friction brake force among the respective wheels such that a magnitude of the difference between the vehicle target yaw rate and the vehicle actual yaw rate reduces.

10. The vehicular brake force control apparatus according to claim 1, wherein the distribution device estimates a ground load of each wheel, and distributes the engine brake force to the respective wheels in accordance with a ratio that corresponds with a ratio of the ground loads of the wheels.

11. The vehicular brake force control apparatus according to claim 1, wherein the distribution device calculates a vehicle target yaw rate based upon a steering amount of the

driver, calculates a difference between the vehicle target yaw rate and a vehicle actual yaw rate, and distributes the engine brake force such that a magnitude of the difference between the vehicle target yaw rate and the vehicle actual yaw rate reduces.

12. A vehicular brake force control method comprising the steps of:
determining whether vehicle behavior of a vehicle is liable to become unstable when engine brake acts;
estimating an engine brake force when engine brake acts in the case that it is determined that the vehicle behavior of the vehicle is liable to become unstable;
distributing the estimated engine brake force to each wheel as a brake force in accordance with a distribution that stabilizes the vehicle behavior of the vehicle; and
controlling at least one of an actual engine brake force and an actual friction control force that are applied to each wheel, such that the brake force distributed to each wheel is attained.

13. The vehicular brake force control method according to claim 12, wherein the vehicle is a rear wheel drive vehicle, and it is determined that the vehicle behavior is liable to become unstable when engine brake acts in the case that a degree of grip of a rear wheel is equal to or less than a predetermined value

14. The vehicular brake force control method according to claim 13, wherein it is determined that the vehicle behavior is liable to become unstable when engine brake acts in the case that the vehicle is in a non-driven state and the degree of grip of the rear wheel is equal to or below the predetermined value.

15. The vehicular brake force control method according to claim 13, further comprising the steps of:
estimating a road surface friction coefficient;
estimating a front-rear acceleration at a rear wheel position and a lateral acceleration at the rear wheel position; and
calculating the degree of grip of the rear wheel based on the road surface friction coefficient, the front-rear acceleration, and the lateral acceleration.

16. The vehicular brake force control method according to claim 12, wherein a threshold value used for occasions when it is determined that the vehicle behavior is liable to become unstable is reduced in accordance with a road surface friction coefficient becoming smaller.

17. The vehicular brake force control method according to claim 12, wherein the engine brake force is controlled based upon the brake force that is smallest among the brake forces distributed to driven wheels.

18. The vehicular brake force control method according to claim 12, further comprising the step of:

estimating, when a brake operation is executed by a driver, an overall vehicle target friction brake force based upon a brake operation amount of the driver, and wherein a sum of the estimated engine brake force and the estimated overall vehicle target friction brake force is distributed among the respective wheels.

19. The vehicular brake force control method according to claim 18, further comprising the step of:

estimating a ground load of each wheel; and wherein a sum of the estimated engine brake force and the estimated overall vehicle target friction brake force is distributed according to a ratio that corresponds with a ratio of the ground loads of the wheels.

20. The vehicular brake force control method according to claim 18, further comprising the steps of:

calculating a vehicle target yaw rate based upon a steering amount of the driver; and
calculating a difference between the vehicle target yaw rate and a vehicle actual yaw rate, and wherein a sum of the estimated engine brake force and the estimated overall vehicle target friction brake force is distributed such that a magnitude of the difference between the vehicle target yaw rate and the vehicle actual yaw rate reduces.

21. The vehicular brake force control method according to claim 12, further comprising

the step of:

estimating a ground load of each wheel, and wherein the engine brake force is distributed according to a ratio that corresponds with a ratio of the ground loads of the wheels.

22. The vehicular brake force control method according to claim 12, further comprising the steps of:

calculating a vehicle target yaw rate based upon a steering amount of the driver; and
calculating a difference between the vehicle target yaw rate and a vehicle actual yaw rate, and wherein the engine brake force is distributed such that a magnitude of the difference between the vehicle target yaw rate and the vehicle actual yaw rate reduces.